REMARKS

In an office action dated April 2, 2004, the Examiner rejected claims 1-17 under 35 U.S.C. §102(e) as anticipated by Steinberg et al. (US Patent 6,433,818).

Steinberg discloses the general concept of using biometric data to recognize the user of a digital camera, and more specifically discloses that the biometric is preferably a user's iris pattern, which is input to the camera using the same CCD array which is used to record images. Applicants have amended the claims herein to more specifically recite certain novel and unobvious features for which a patent is sought herein. In particular, amended independent claim 1 recites the feature of non-coincident light paths for the standard camera image and the biometric representation. Amended independent claims 6 and 13 recite that user identifying data derived from the biometric user identification is associated with the images captured by the camera. As amended, the claims are patentable over the cited art.

Claims 1-5: Non-coincident light paths

Steinberg discloses an implementation for capturing a user's iris pattern using the same CCD array which is used to record images. In accordance with *Steinberg*, a semi-reflective mirror/beam splitter can be rotated to multiple positions, whereby in one position light from the standard camera lens is transmitted to the CCD array, and in another position light from the viewfinder (i.e., the user's iris) is transmitted to the CCD array. In both cases, the light follows a common (coincident) path from the mirror to the CCD array, projecting the image onto the array at approximately a right angle.

Applicants disclose a similar scheme in their Figs 1A-1C. However, applicants disclose several further embodiments, specifically in Figs. 2 and 3, in which the light paths are not coincident, and in which they meet at the CCD at an angle with respect to each other. I.e., the

light from the image to be photographed meets the CCD at approximately a perpendicular angle, to minimize image distortion, but the light from the iris meets the CCD at a different angle, causing a distorted image.

This alternative embodiment, claimed in independent claim 1, has the advantage of not requiring a rotating mirror or similar member to deflect light through multiple divergent paths, and is therefore simpler to implement. Depending on the implementation, it may require no moving parts at all. *Steinberg*'s implementation is apparently limited to fairly expensive cameras using a TTL (Through the Lens) or SLR (Single Lens Reflex) design. However, many digital cameras forego the expense and mechanical complexity of such a design. Since digital cameras are capable of showing the image before capture on an LCD display, most digital cameras rely primarily on the LCD, and include a supplementary viewfinder (which does not look through the camera lens). Additionally, most digital video cameras have no direct optical viewfinder at all: they include a small LCD display inside the camera, which functions as a viewfinder. *Steinberg*'s implementation is not well suited to such designs, and in particular, is not well suited to digital video.

The drawback to the alternative embodiment of claim 1 is that the iris image used for biometric identification is necessarily distorted, potentially reducing the accuracy of biometric identification. Applicants addressed this issue in their specification as follows:

> It will be recognized that in at least some of the configurations shown above, and in other variations which may be conceived within the scope of the present invention, light from the photographers iris may strike the optical sensor array at an oblique angle or pass through prisms or similar optical media, any of which may distort the image which is captured by the optical sensor array. For example, the image may be elliptical rather than circular. The purpose of capturing an image of the iris is not to produce a true picture of the iris, but to match the captured image with data from a previously captured image stored in the database. Therefore, as long as the process is repeatable, the fact that it does not capture a true image of the photographer's iris is irrelevant. [p. 9, line 24 - p. 10, line 6]

> ... The iris scan summary is a digital record of multiple iris features, which is produced by obtaining a digital image of the iris and identifying and abstracting the various features of the iris from the image. Preferably, this iris scan summary is encoded into a record of approximately 512 bytes or less. Suitable iris recognition technology for high discrimination iris recognition in a high security context is available from, among others, Iridian™ Technologies. For purposes of the present invention, such a high discrimination capability is considered unnecessary, and it may be possible to reduce the number of features identified and the corresponding size of the iris scan summary. For example, the aforementioned Iridian™ Technologies iris recognition boasts a capability of recognizing 244 degrees of freedom, having odds of producing a false match as low as 1 in 10^{48}. Such a capability may be desirable for guarding secrets of national importance, but it is overkill for purposes of the present invention. Typically, one would expect that ten or fewer individuals would be authorized to use a single camera. Furthermore, to discourage theft, it is enough to make it highly unlikely that the thief will be able to use the camera, and not necessarily to make the odds astronomical. It is believed that if the odds of a false match are 1 in 100 or less, such accuracy is sufficient for purposes of the present invention. *This relaxing of the constraints makes incorporation of biometric capability as described herein more practical in the context of a camera. It not only reduces the amount of data which must be stored in the photographer profile, but it reduces the required accuracy of an image taken of the iris.* This iris image may be at a fairly low resolution, or may be distorted, monochromatic, etc., and still fulfill the requirements of biometric identification described herein. [p. 11, line 12 - p. 12, line 3, emphasis added]

In other words, applicants recognized that the high accuracy of conventional iris biometric identification is not necessary for purposes of the present application. Applicants designed an alternative optical arrangement which is simpler to implement in a digital camera, although it distorts the iris image and sacrifices some identification accuracy.

Steinberg assumes that conventional iris recognition will be used, in which the image of the user's iris should not be distorted. *Steinberg* teaches an arrangement in which light from the iris and light from the photographed image follow the same path from the mirror to the CCD array, striking the CCD array at the same perpendicular angle.

Applicants' amended claim 1 recites:

1. A digital camera, comprising:

a housing;

a digital optical sensing apparatus mounted within said housing, said digital optical sensing apparatus sensing optical images;

a first optical member focusing light representing a biometric parameter of a user of said digital camera for capture by said digital optical sensing apparatus, said light representing a biometric parameter of a user traversing a first light path through said camera from said first optical member to said digital optical sensing apparatus;

a second optical member focusing light from images of interest to be captured by said digital optical sensing apparatus, said light from images of interest to be captured traversing a second light path through said camera from said second optical member to said digital optical sensing apparatus, *said second light path not being coincident in any segment with any segment of said first light path, said second light path encountering said digital optical sensing apparatus at a non-zero angle with respect to said first light path*;

a processor for controlling operation of said digital camera, said processor operating said digital camera in at least two modes of operation, including:

(a) a first mode of operation, wherein said digital optical sensing apparatus senses a biometric parameter of a user of said camera, said processor identifying said user from said biometric parameter; and

(b) a second mode of operation, wherein said digital optical sensing apparatus captures and records an image of an object of interest. [emphasis added]

Because *Steinberg* teaches two light paths which are coincident in their final segment, the italicized limitation is not met, and amended claim 1 is not anticipated by *Steinberg*.

Nor is amended claim 1 obvious over *Steinberg*. As explained above, *Steinberg* assumes that the iris image should not be distorted to achieve required accuracy of identification. In order to avoid distorting the iris, it should follow the same light path as the photographed image. Applicants' observations that distortion of the iris representation is acceptable, along with consequent reduction of identification accuracy, is not taught or suggested by *Steinberg*.

Claims 6-19: User identifying data associated with captured images

Steinberg discloses that biometric identification is used solely for the purpose of preventing unauthorized use of the camera. Applicants disclose that preventing unauthorized use is but one

purpose of biometric identification. In applicants' preferred embodiment, biometric identification is used to embed the identity of the photographer with the photographed image. This feature is claimed in independent claims 6 and 13. As a further enhancement, each photographer can have his own profile for camera operation, i.e. a preferred set of camera settings or parameters, such as operating mode, simulated ISO type, aperture, light metering method, etc. Responsive to identifying the photographer, the camera is automatically set to the photographer's preferred profile. This additional aspect is claimed in dependent claims 18 and 19.

The automatic association of photographer identity with the photographic image is possibly underappreciated at the present time, but applicants believe this feature will assume greater importance in the future. For the casual use camera, such as one used for family pictures, it means that it is possible to identify the photographer responsible for a particular photo, without the need to manually record such information. This is useful information, not only for itself, but because it may also help to remember the circumstances under which a photograph was taken. But applicants believe that a more significant use of their claimed invention lies in the growing field of authenticating records. A digital camera which embeds photographer identity, such as a digital signature, in the image, creates a permanent record of the person responsible for that image. In circumstances where intellectual property rights in photographic images are at issue, or where proving the source of a photographic image might become an issue, such a record could be very useful. Applicants believe that, once this feature is offered in the marketplace, any professional photographer will want to have his photographs unmistakenly and undeniably identified as his own, and that such a feature therefore creates value in the marketplace.

Representative amended claim 6 recites:

6. A digital camera, comprising:
a housing;
a digital image capturing apparatus for capturing a plurality of digital images of respective objects of interest;
a biometric sensing apparatus for sensing a biometric parameter of a user of said digital camera;
a processor for controlling operation of said digital camera;
a memory, said memory for storing biometric parameters associated with a plurality of potential users of said digital camera;
wherein said processor identifies each user of said plurality of potential users of said camera by comparing data obtained from said biometric sensing apparatus with said biometric parameters associated with said plurality of potential users in said memory, and, *responsive to identifying a user, associates respective user identifying information with each digital image* of an object of interest captured by said digital image capturing apparatus. [emphasis added]

Amended claim 13, while not identical in scope, contains limitations analogous to the italicized limitations above.

Steinberg neither teaches nor suggests such a feature. The sole use *Steinberg* makes of biometric identification is to authorize or deny access to using the camera. *Steinberg*'s frame of reference is thus entirely limited to security or collection of money for using the camera. *Steinberg* does not see the broader picture of protecting intellectual property rights in photographic images, authenticating photographs, or simply providing additional useful information to the casual user. Accordingly independent claims 6 and 13, and claims dependent from them, are neither anticipated by, nor obvious over, *Steinberg*.

In view of the foregoing, applicants submit that the claims are now in condition for allowance and respectfully request reconsideration and allowance of all claims. In addition, the

Examiner is encouraged to contact applicants' attorney by telephone if there are outstanding issues left to be resolved to place this case in condition for allowance.

Respectfully submitted,

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